Date: Tue, 29 Mar 94 18:11:50 PST
From: Info-Hams Mailing List and Newsgroup <info-hams@ucsd.edu>
Errors-To: Info-Hams-Errors@UCSD.Edu
Reply-To: Info-Hams@UCSD.Edu
Precedence: Bulk
Subject: Info-Hams Digest V94 #342
To: Info-Hams

Info-Hams Digest Tue, 29 Mar 94 Volume 94 : Issue 342

Today's Topics:

Send Replies or notes for publication to: <Info-Hams@UCSD.Edu>
Send subscription requests to: <Info-Hams-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Info-Hams Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/info-hams".

We trust that readers are intelligent enough to realize that all text
herein consists of personal comments and does not represent the official
policies or positions of any party. Your mileage may vary. So there.

Date: 29 Mar 94 22:15:12 GMT
From: news-mail-gateway@ucsd.edu
Subject: A novice needs some help!
To: info-hams@ucsd.edu

Text item: Text_1

>...tell me if I can buy a pair of ham-radios for me and my
>friend in some other country and talk whenever we want?
>Giridhar Tatavarti

Hi Giridhar, Contrary to what you may hear, international schedules are difficult to keep unless Mother Nature is cooperating and you are running maximum legal power and a multi-element beam antenna. We are near the low of a sunspot cycle which has a negative effect upon round-the-world communications and you will be competing with other amateurs who run the legal maximum power and beam antennas.

You can almost always find *A* foreign amateur radio operator to talk to... unfortunately, it may not be *THE* amateur radio operator to whom you wish to talk. I do not mean to discourage you, but we must be realistic about what is possible at any given moment. Last night I could hear no amateurs on SSB above 40 meters.

73, Cecil, kg7bk@indirect.com (I do not speak for Intel on Internet)

Date: Tue, 29 Mar 94 00:50:43 GMT
From: ihnp4.ucsd.edu!library.ucla.edu!agate!howland.reston.ans.net!EU.net!sunic!psinntp!psinntp!newsserver.pixel.kodak.com!kodak!kodaki.kodak.com!swohl@network.ucsd.edu
Subject: Good novice HF rig recommendation
To: info-hams@ucsd.edu

oFollow up to dkerk@eis.calstate.edu, this message is being posted as a courtesy. Any mail sent to this address will be trashed

---

Hi, I just passed my novice exam, and I am looking for recommendations on a good startup rig. These are the qualities I am looking for:

a) Reliable, stable, well mannered radio.
b) About 100 w maximum power. Runs on DC or AC
c) Really low TVI, phone interference, and such. This is critical, with a lot of nearby neighbors.
d) All band receive
e) Good receiver selectivity and noise rejection. Lots of electrical static near the home.
f) Good basic SSB performance for when I move up.
g) About $300 to $400.
i) Service and support still available.
j) Transmits on all the standard amateur bands. 80,40,15, and 10 at least.
k) Good CW, not chirpy or a bad hum, etc.

I've considered something like a Kenwood TS 180.

I'd appreciate the recommendations of the net. Please e-mail to dkerk@eis.calstate.edu or dkerk@ctp.org. Thank you.

Date: 28 Mar 1994 18:35:49 -0500
From: elroy.jpl.nasa.gov!sdd.hp.com!vixen.cso.uiuc.edu!howland.reston.ans.net!news.intercon.com!news1.digex.net!access.digex.net!not-for-mail@ames.arpa
Subject: Hamfest List
To: info-hams@ucsd.edu

MID-ATLANTIC HAMFEST LISTING March 27, 1994

The following is a listing of known hamfests in the MD/NJ/PA/VA area. I will update this list as necessary. Please send any additions or corrections to me at cps@access.digex.net so that others may benefit.

Thanks,

Chris Smolinski, N3JLY

May 21, 1994:

Cherryville Hamfest, 8AM-2PM, $6 admission, $10 tailgating, $15 tables
Warren County Farmers Fairgrounds, Rt 518 North, Harmony, NJ I78-exit 3.
Contact Keith Burt, KF5FK, (908) 788-4080 before 10PM
VE Test Session Contact Marty Grozinski, NS2K, (908) 806-6944 before 9PM
Talk-In 147.375+ & 146.820-

May 22, 1994:

Great Hagerstown Hamfest, 8AM-3:30PM, $5 adm, $5 tailgating, $20 tables
Hagerstown Jr COllege Rec Center, Exit 32B from I-70, right at Edgewood Rd
Contact Page Pyne or Fred Bailey (301) 714-0688
VE Exams 9AM contact Pat KQ8E at (304) 289-3576
Talk-In 146.34+

June 5, 1994:

Ole Virgina Hamfest, 8AM-3PM
Prince William County Fairgrounds, Manassas, VA

June 19, 1994:

Father's Day Hamfest, 8AM-3PM, $5 adm, $5 tailgating
Walkersville Fire Co, Walkersville, MD, rt 15 to rt 26 to rt 194
Frederick Amateur Radio Club, PO Box 1260, Frederick, MD 21702
Talk-In 146.52, 147.06+, 448.425-

July 10, 1994:

Maryland Hamfest, 8AM-?, tailgating opens at 6AM
Timonium Fairgrounds, York Rd, I-695 to I-83 to Timonium Rd
BRATS, PO BOx 5915, Baltimore, MD 21208
VE Exams 10AM, Pre-registration required
Talk-In 147.03+, 224.96-

July 16, 1994:

Red Rose Repeater Assn, 9AM-3PM $5 adm, $5 tailgating, $20 tables
McCaskey High School, Reservoir & N Franklin Streets, Lancaster, PA
Red Rose Repeater Assn, PO Box 8316, Lancaster, PA 17604
Talk-In 147.015+

August 7, 1994:

Southern Patuxent Hamfest, 7AM-2PM, $5 adm, $5 tailgating, $25 tables
Prince George County Equestrian Center, Upper Marlboro, MD
Rt 301/ Rt 4, exit 11-A (Rt 4 Pennsylvania Ave) from DC Beltway I-495
Contact: Southern Patuxent ARC, PO Box 399, St Leonard, MD 20685
(410) 586-2177
Talk-In 147.15

Hamfest 94, 8AM-?, $5 adm, $3 tailgating
Bucks County Drive In Theater, rt 611, 6mi N of Pa Turnpike exit 27
Mid Atlantic Radio Club, PO Box 352, Villanova, PA 19085
Talk-In 147.06, 145.13

August 14, 1994:

SARA Carroll County Hamfest, 8AM-?, $5 adm, $5 tailgating, $8 tables
Carroll County Ag Center, Smith Ave, Westminster, MD
Contact: Alan Parker, KS3L, (410) 859-1475
SARA Hamfest, 607 Brentwood Rd, Linthicum, MD 21090
Talk-In 146.52, 224.68, 224.64

Hamfest & Computerfest, 8AM-?, $4 adm, $7 tailgating, $25 tables
Career Institute of Technology, Easton, PA
Delaware-Lehigh ARC, RR 4 Greystone Bldg, Nazareth, PA 18064-9211
(610) 820-9110
Talk-In 146.70

  September 17&18, 1994:

Virginia Beach Hamfest $6 adm, $15 tailgating, $30 tables, $125 booths
Virginia BEach Pavillion
Manny Steiner, K4DOR, 3512 Olympia Lane, Virginia Beach, VA 23452
(804) HAM-FEST

  September 18,1994

South Jersey Radio Assn, 8AM-3PM, $5 admission, $5 tailgating
Pennsauken High School Parking Lot, near US rt 130 / NJ rt 73
Contact Diane Nafis, N2LCQ, (609) 227-6281, (609) 228-8088
VEC Test Session registration at 9:30 AM
Talk-In 145.290-

  October 30, 1994:
Mason Dixon Hamfest 8AM-?, $5 adm, $5 tailgating, $15 tables
Carroll County Ag Center, Westminster, MD
Mason Dixon Hamfest, PO Box 763, Hanover, PA 17331
VE exams $5.60, 9AM, reg 8AM, Page Evans NE3P, (717) 359-7610
Talk-In 145.410-

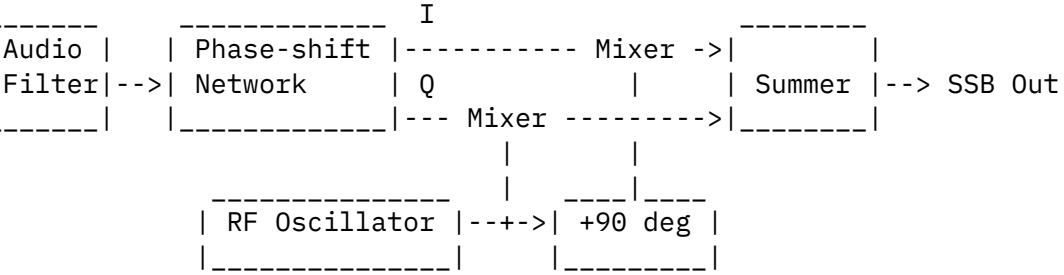
Date: 29 Mar 94 21:34:37 GMT
From: sdd.hp.com!sgiblab!c2tech!brucep@hplabs.hp.com
Subject: HELP: Anyone know what a XR2206 chip is?
To: info-hams@ucsd.edu

EXAR is still around - they are a subsidiary of Rohm, a Japanese IC company:

EXAR (in San Jose): 408-434-6400

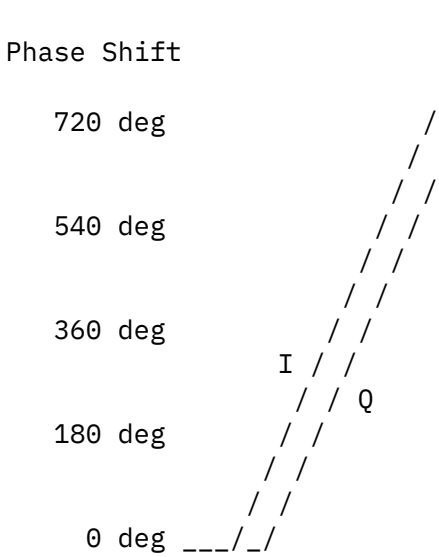
Date: 29 Mar 94 21:26:17 GMT
From: sdd.hp.com!col.hp.com!srgenprp!alanb@hplabs.hp.com
Subject: How phasing SSB Exciters Work (Was: RF and AF speech processors)
To: info-hams@ucsd.edu

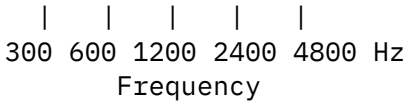
In another thread, I claimed that phasing-type single-sideband generators sound better than filter-type generators because phasing exciters have flatter amplitude and delay response. Gary Coffman disputed that. Rather than respond to Gary's long replies in detail, I'll just summarize how phasing-type SSB exciters work:



I and Q are two audio outputs with a constant phase difference between them of 90 degrees. The input filter limits the audio frequency response to the range of the phase-shift network. The "+90 deg" box can be switched to -90 degrees to get the opposite sideband. (The output of each mixer is a DSB signal.)

The audio phase shift network is the interesting (read difficult) part of the system. It must maintain a 90 degree phase difference and excellent amplitude matching between the two outputs over something like a 10:1 frequency range (300 Hz - 3000 Hz). It generally does that by causing each of the two outputs to have a constantly-rising phase shift versus frequency characteristic, like thus:





I may have gotten the scaling off a bit, but the principle is right:
Both channels have constantly-changing phase shifts, but the difference
is always 90 degrees. Note that the frequency scale is logarithmic.
If phase were linear with frequency, then that would equal constant
delay. Since that's not true, there is some variation in group delay
with frequency, but it is a nice smooth curve that has little affect
on audio quality. (As opposed to the crystal filter used in a filter-
type SSB generator which has "bumpy" group delay, expecially at the
high and low band edges.)

The design of the two channels' phase-shift networks is such that
any errors in linearity occur in different places. That means that
you can't make it work properly unless both channels have nice
linear phase versus log(frequency). The same goes for amplitude.
I suppose you could design a diabolical phase-shift network that
had unflat (but matched) frequency response in the two channels,
but why would you do that?

The input audio filter can also add to amplitude or delay distortion.
However, it's not hard to design the filter to minimize the problem.
You don't need the sharp cutoff of a crystal filter designed for
receiving applications because any spurious below 30 or 40 dB down
will be covered up by the transmitter power amplifier's splatter
anyway. Also, audio filters are easier to build accurately than
crystal filters because of the lower Q and lower frequency.

The conclusion: Phasing-type SSB generators have flatter group delay
and amplitude than filter-type generators. You really can hear the
difference in the on-the air signal, in my experience.

Gary Coffman (gary@ke4zv.atl.ga.us) wrote:
: In article <1994Mar26.201156.9246@arrl.org> zlau@arrl.org (Zack Lau (KH6CP))
writes:
: >SSB crystal filters are designed for steep skirts for good
: >shape factors. This means that without any equalizing networks
: >(which normally double the complexity and send the cost through
: >the roof), the phase response at the passband edges are *terrible*
: >The fact that the center frequency of the crystal filter is much
: >higher just means that the Q of the parts has to be that much
: >better. The mathematics of the phase and amplitude response
: >tradeoffs are unchanged-- the tradeoffs are identical for a
: >3 kHz audio filter and a 3 kHz SSB filter (assuming ideal
: >parts--with real parts its easier at audio...)

: Apples and oranges. The phasing SSB exciter is using an audio
: *phase shift network*, the filter exciter is using a RF filter.

I think Zack was referring to the input audio filter.

: Now the AF phasing network may be considered a sort of filter,
: but that's not it's designed purpose, and for sure it's not a
: 3 kHz bandpass response. Instead it has to maintain a constant
: 90 degree phase shift across multiple octaves. That's tougher.

But the hard part is getting the ampltude and phase matching
to within a fraction of a dB or degree. As explained above, if you
do that, the overall amplitude and delay response versus frequency
will be quite good.

AL N1AL

Date: 30 Mar 94 00:38:55 GMT
From: sdd.hp.com!hpscit.sc.hp.com!rkarlqu@hplabs.hp.com
Subject: How phasing SSB Exciters Work (Was: RF and AF speech processors)
To: info-hams@ucsd.edu

Phasing type SSB exciters produce a higher fidelity output
than filter type exciters *using filters of the type typically
found in ham equipment*. If you get high quality filters like
the Lumda FDM telecom filters, you get do just as well with
a filter type exciter. These filters will run you about $125 each.

In any event, if the receiver is a transceiver, and it uses
the same filter for receive and transmit, then all the nasty
ripples you avoided with a phasing type transmitter will
be reintroduced at the receiver. So you really need a phasing
transmitter and phasing receiver to get "hi-fi" audio. Or
use Lumda filters at both ends.

(Lumda is a small outfit that took over the FDM xtal filter
market when the big boys pulled out after T1 replaced FDM for
99% of the telecom market. FDM is still used for phone calls
to Alaska and Hawaii. It's SSB but doesn't sound like ham SSB.)

Rick Karlquist N6RK
rkarlqu@scd.hp.com

Date: 29 Mar 94 22:10:08 GMT

From: news-mail-gateway@ucsd.edu
Subject: Hustler Mobile ant help
To: info-hams@ucsd.edu

Text item: Text_1

>I plan on using the kenwood 440s with a dentron super tuner.
>WA2MZF in the frozen tundra of northern New York.

Hi James, With an antenna tuner, you can use your 10m Hustler on
17m-10m and maybe even 20m. The 10m Hustler resonator is less
lossy on 17m than the 17m resonator! I use a Radio Shack CB 108 in.
metal whip on 20m-10m with an antenna tuner with good results.
Your 30m resonator will radiate more RF on 40m than your 40m
resonator. Once you get used to a mobile antenna tuner, you'll
never go back to the hassle of changing resonators every time
you change bands.

73, Cecil, kg7bk@indirect.com (I do not speak for Intel on Internet)

Date: Sun, 27 Mar 1994 23:28:19 GMT
From: agate!msuinfo!harbinger.cc.monash.edu.au!newshost.anu.edu.au!sserve!usage!
metro!ipso!rwc@ames.arpa
Subject: IPS Daily Report - 27 March 94
To: info-hams@ucsd.edu

SUBJ: IPS DAILY SOLAR AND GEOPHYSICAL REPORT
ISSUED AT 27/2330Z MARCH 1994 BY IPS RADIO AND SPACE SERVICES
FROM THE REGIONAL WARNING CENTRE (RWC), SYDNEY.
SUMMARY FOR 27 MARCH AND FORECAST UP TO 30 MARCH
No warning is current.

1A. SOLAR SUMMARY
Activity: very low

Flares: none.

Observed 10.7 cm flux/Equivalent Sunspot Number : 088/032

1B. SOLAR FORECAST

	28 March	29 March	30 March
Activity	Very low	Very low	Very low
Fadeouts	None expected	None expected	None expected

Forecast 10.7 cm flux/Equivalent Sunspot Number : 088/032

1C. SOLAR COMMENT
None.

2A. MAGNETIC SUMMARY
Geomagnetic field at Learmonth: quiet to unsettled

Estimated Indices :	A	K	Observed A Index 26 March
Learmonth	09	2212 3233	
Fredericksburg	05		09
Planetary	08		09

Observed Kp for 26 March: 2233 2322

2B. MAGNETIC FORECAST

DATE	Ap	CONDITIONS
28 Mar	10	Quiet to unsettled.
29 Mar	15	Mostly quiet to unsettled, with brief active active periods possible.
30 Mar	25	Mostly quiet to unsettled, with brief active active periods possible.

2C. MAGNETIC COMMENT
None.

3A. GLOBAL HF PROPAGATION SUMMARY

	LATITUDE BAND		
DATE	LOW	MIDDLE	HIGH
27 Mar	normal	normal	normal

PCA Event : None.

3B. GLOBAL HF PROPAGATION FORECAST

	LATITUDE BAND		
DATE	LOW	MIDDLE	HIGH
28 Mar	normal	normal	normal
29 Mar	normal	normal	fair
30 Mar	normal	fair-normal	poor-fair

3C. GLOBAL HF PROPAGATION COMMENT
NONE.

4A. AUSTRALIAN REGION IONOSPHERIC SUMMARY
MUFs at Sydney were 10-20% enhanced 00-08UT and from 17UT onwards, and otherwise near predicted monthly values. Spread F occurred 13, 15 and 17UT.

Observed T index for 27 March: 64

Predicted Monthly T Index for March is 40.

4B. AUSTRALIAN REGION IONOSPHERIC FORECAST
DATE   T-index MUFs
28 Mar   55   Mostly near predicted monthly values, with occasional
                enhancements of 15-30%.
29 Mar   50   Near predicted monthly values.
30 Mar   45   Near predicted monthly values.

4C. AUSTRALIAN REGION COMMENT
Sporadic E layer was observed throughout most of yesterday. Similar
conditions are expected today, with night-time Spread F also
possible. MUFs at Townsville were generally near predicted monthly
values, while Hobart MUFs were closer to those observed at Sydney.
--
IPS Regional Warning Centre, Sydney |IPS Radio and Space Services
email: rwc@ips.oz.au fax: +61 2 4148331 |PO Box 5606
RWC Duty Forecaster   tel: +61 2 4148329 |West Chatswood NSW 2057
Recorded Message   tel: +61 2 4148330 |AUSTRALIA

Date: Tue, 29 Mar 1994 08:50:18 GMT
From: ihnp4.ucsd.edu!dog.ee.lbl.gov!agate!howland.reston.ans.net!wupost!csus.edu!
netcom.com!linley@network.ucsd.edu
Subject: obscenity...
To: info-hams@ucsd.edu

In ye olden post oo7@astro.as.utexas.edu (Derek Wills) spake...
>dhughes@prairienet.org (Dan Hughes) asks:
>
>>>I just passed my no-code test last week, and have been listening to some
>>>ham chatter on my SW receiver. Saturday night on 3910 kHz I heard some
>>>of the most disgusting language I've encountered anywhere. One guy was
>>>spouting one obscentity after another, and three other guys were laughing
>>>at his inept signal and giving it right back to him. All but the
>>>instigator were regularly giving their calls. Is this pretty much what I
>>>have to look forward to?
>[...]
>
>   If you have the no-code license, you won't be tempted to talk to this
>Low Life, and if you pass the code test you can work people on CW who
>don't act like this (it takes so long to swear on CW).

Ah yes, yet another reason to learn CW. On the other hand, I don't want to

just let the low-lifes take over the phone bands either. The best way to get rid of them, IMHO, is for more good hams to get on the bands where the scum live. Quiet frequencies (be it on HF or VHF/UHF repeaters) seem to attract these kinds of low-lifes. A busy frequency is usually a "clean" frequency.

dahdahdididi dididididahdah
dahdidah di dahdididididi di dahdahdidah dahdahdidi

--
Bruce James Robert Linley ---- linley@netcom.com ---- Amateur radio: KE6EQZ

Date: Mon, 28 Mar 1994 22:37:45 GMT
From: news.larc.nasa.gov!lerc.nasa.gov!magnus.acs.ohio-state.edu!math.ohio-state.edu!howland.reston.ans.net!europa.eng.gtefsd.com!library.ucla.edu!csulb.edu!csus.edu!netcom.com!slay@ames.arpa
Subject: Obscenity on ham bands
To: info-hams@ucsd.edu

Dan Hughes (dhughes@prairienet.org) wrote:

: I just passed my no-code test last week, and have been listening to some
: ham chatter on my SW receiver. Saturday night on 3910 kHz I heard some
: of the most disgusting language I've encountered anywhere. One guy was
: spouting one obscentity after another, and three other guys were laughing
: at his inept signal and giving it right back to him. All but the
: instigator were regularly giving their calls. Is this pretty much what I
: have to look forward to?
: --
Unfortunately - that might be the case. Try listening on the CW bands.
You will rarely, if ever, hear that kind of language. Many of us duck
down to the CW bands to get away from the garbage on phone.

73 and good luck; and keep the faith (in Ham Radio)
de Sandy WA6BXH/7J1ABV   slay@netcom.com

PS: There are plenty of Extra Class licensees who are guilty of the
transgressions you mention. You should NOT infer that I am saying
anything about "no coders". I've lived in Japan for many, many
years where 92% of all licensed amateur stations belong to "no coders".
They are pretty good - but, there are the bad apples in every barrel.

Date: 30 Mar 94 01:00:03 GMT
From: dog.ee.lbl.gov!agate!kabuki.EECS.Berkeley.EDU!kennish@ucbvax.berkeley.edu
Subject: Ramblings about Intermod and the FT-530 (Warning: LONG)

To: info-hams@ucsd.edu

Greetings again. I've decided to put together a small Q/A blurb (now long) to help quell some common misconceptions about what intermod is, and what other things cause IM like behavior. Also, at the end are some random musings about the FT-530. I believe that all below is correct, if you wish to make a correction, or dispute facts, please E-mail me and I will consider. I will ignore flames. I hope to maybe add this (after editing / corrections if needed) to the FAQ.

Q: What is distortion?

A: Distortion is a process where where a non-linear signal path creates frequencies that were not there originally. If you have a single frequency and pass it through any linear network and then look at the output on a spectrum analyzer, you will see that frequency and only that frequency. If you pass that same signal through a non-linear system, you will note the original frequency plus harmonics at multiples of the original frequency. We call this harmonic distortion. The relative magnitudes of the harmonics are a function of the non-linearity, but in general, they tend to fall off as the order (frequency) of the harmonic rises. For those that are more mathematically inclined, if you plot the transfer function of the system and it is symmetric with respect to the y-axis, then you will get even order (2nd, 4th, 6th, etc.) harmonics. If it is odd symmetric, then you get odd (3rd, 5th, 7th, etc.) harmonics. If there is no symmetry, then you will get components at every multiple. Some of you may have imagined distortion coming from a circuit that altered the shape of a waveform. This is equivalent. A single frequency signal is a sine wave. By passing it through a non-linear network, one obtains something other than a pure sine wave. Now, if you take that waveform, and subtract from it the original sine wave, you get the difference or distortion products. If you now look at that, you will find (proof is Fourier analysis) that the distortion signal is a sum of sine waves at the harmonic frequencies that are scaled in proportion as dictated by the specific non-linearity. Those with a computer are encouraged to examine the relation between frequency and time domain analysis.

Q: What is intermod?

A: Intermodulation distortion is a specific case of distortion that results when a signal consisting of two or more distinct frequencies is passed through a non-linear network. Perhaps

the easiest way to demonstrate this is through a bit of math.
(Get your algebra and trig caps on...) Suppose we have a signal
two signals, sin(w1t) and sin(w2t) which we shall denote A and
B (ASCII sucks for equations) where w1 and w2 are two distinct
frequencies. Let X be A+B. Note that addition is linear and
the signal X, if examined on a spectrum analyzer, will still show
only two frequencies, w1 and w2.

   Now, let us imagine we have a linear network whose transfer
function is Y=K1*X. (This is a straight line...) Then the
output Y is equal to K1*A + K1*B, or K1sin(w1t)+K1sin(w2t).
Note that there are only two frequencies, w1 and w2. All is
fine. Now substitute the linear network with say, a generalized
third order polynomial, Y=K1*X+K2*X^2+K3*X^3.

Now substitute X=A+B. Then expanding, we obtain:

$$Y=K1(A+B)+K2(A+2AB+B)+K3(A+3AB+3AB+B)$$

Substituting the A=sin(w1t) and B=sin(w2t) and organizing by terms
results in the following components:

  K2 (This is a DC term)
+ (K1+2.25K3)sin(w1t)+(K1+2.25K3)sin(w2t) (This is a linear term)
+ K2sin([w1+w2]t) (This is a sum of two frequencies term or 2nd order intermod)
+ K2sin([w1-w2]t) (This is a difference of two frequencies term/2nd IM)
+ 0.5K2sin(2w1t) (This is a 2nd harmonic term)
+ 0.5K2sin(2w2t) (This is also a 2nd harmonic term)
+ 0.25K3sin(3w1t) (This is a 3rd harmonic term)
+ 0.25K3sin(3w2t) (This is also a 3rd harmonic term)
+ 0.75K3sin([2w1+w2]t) (This is a 3rd order intermod term)
+ 0.75K3sin([2w1-w2]t) (This is also a 3rd order intermod term)
+ 0.75K3sin([2w2+w1]t) (This is yet another 3rd order intermod term)
+ 0.75K3sin([2w2-w1]t) (This is the last 3rd order intermod term)

Note that apart from the second line, all the terms consist of frequencies
that did not exist in the input signal. These are distortion products.
Unlike the single frequency input case, there are terms which consist
of sums and differences of the two frequencies, some of which consist
of sums and differences of harmonics of the input frequencies. These
are intermod products. For reasons that are too complex to go into
here, most circuits exhibit 3rd order distortion less 2nd order
distortion. Hence the test for 3rd order TTID (Twin Tone Intermod
Distortion), where the term 2w1+/-w2 is set to be in the passband of
interest.

Example: w1=2pi*446MHz, w2=2pi*447MHz. The TTID product will appear at
both 445 and 448 MHz.

Intermod distortion is particularly troublesome since there are an almost infinite number of w1 and w2 combinations what will cause a tone to appear at the frequency of interest.

Q: I'm getting spurious reception but I can't trace it to IM. What is it?

A: If it is not harmonic distortion, it could be image response. Note that most all radio receivers use the hetrodyne method of detecting and processing the incoming RF. Briefly, to tune the radio, the incoming RF is mixed (multiplied) with a local oscillator (LO). If the LO frequency is at a frequency Fif, then a tone will appear at Frf +/- Flo. The system is designed so that the IF strip has a narrow bandpass frequency at Fif. Thus, by adjusting Flo using the synthesizer, signals at frequency Flo+/-Fif will be received by the system.

Example: Fif=10.7MHz Flo=110 MHz. The system will receive RF signals at EITHER (110-10.7)=99.3 MHz OR (110+10.7)=120.7 MHz.

Note that the system responds equally to two different frequencies, of which only one is desired. The false response the to non-desired signal is called image response. Note that this has nothing to do with harmonic or IM distortion, it's just the way mixers work. (There are image suppression mixers that use complex signals, but they are beyond the scope of this discussion, for now...) In order to reduce image response, the incoming RF must be filtered to remove signals at the image frequency before the mixer. This filter is commonly referred to as the image rejection filter. This makes life interesting for the RF designer....

Example: Let's talk about the two meter ham band, 144 to 148 MHz. Now, what are the choices for IF frequency? First, assume we have a fixed image rejection filter. Then, the filter must pass at least 144 to 148 MHz. This means that the IF frequency must be at least half the bandwidth of interest (144 to 148 MHz) or 2 MHz assuming a perfect image reject filter.

In practice, as filters are quite non-selective, the IF is placed substantially higher than half the bandwidth of interest. The Yaesu FT-530 uses 15.25 MHz. This means that signals that are 30.5 MHz away from the desired signal could be imaged into the receiver. Note that the masses want and have gotten extended RX in HTs. The FT-530 covers 110 to 180 MHz, and with a fixed image reject filter would require a IF frequency of at least 35 MHz. (Low IF's are preferable as the bandpass filters for channel select are easier to get, and the circuits burn less power == long battery life). To use a 15.25 MHz IF, Yaesu uses a tunable image reject filter. The control voltage for the VCO within the VFO is used to vary the capacitance of a varactor (hyper-abrupt junction pn diode used for tuning). Thus,

in theory, if the image reject filter is narrow, but tunable, things will be fine. In practice, a narrow tunable filter is hard, and expensive -- recall this is the primary reason superhet came around in the first place. So, in the FT-530, the image reject filter needs to be narrower than 30.5 Mhz and tune from 110 to 180 MHz. Not impossible, but not easy to do well. Similar examples could be made from the UHF side of the unit.

Q: That sounds great, so what's the catch?

A: Varactors are terribly non-linear. In many circuits that use varactors, the tuning voltage is in the tens of volts, so that the small RF signal will not disrupt the linearity of the diode. In an HT, the low battery voltage means that a low tuning voltage diode is used, which is much more non-linear. So, by having an unit with extended RX, you need a tunable image reject filter. This utilizes varactors, which are quite non-linear thus making the IM problem much worse. See?

Q: Well, older HT's still suffer from IM...

A: Sure, nothing is perfectly linear, and at some point, any RF circuit will IM distort. A useful figure of merit is the third order intercept point, or IM3. This is the input power level where the power of the fundamental or desired signal at the output is equal to the power of the intermod product. A by-product of the desire of the masses for infinite battery life is that the manufacturers are using lower and lower currents in the receive chain. This means that it is easier to overload the front end and drive it non-linear. So, independent of the extended RX, you can still intermod. Newer HT's with their lower current front ends will suffer more, just because they are more easily overloaded, not because of their extended RX, though that makes the problem a lot worse.

I hope the above sheds some light and quells some of the myths of intermod, image response and harmonic distortion. I could go on forever (or at least for a very long time, but my boss would get mad....) However, I will include this little tidbit about the FT-530.

Many people love their FT-530. I do, I think it's a great radio. But, this morning, I really looked at the schematic, and now I know why it behaves the way it does. Yes, it's really two radios in one. There is a VHF radio and a UHF radio. The VHF radio has a 15.25 MHz IF, a 455 KHz 2nd IF, and a FET mixer, and utilizes a varactor tuned image reject filter. The UHF radio is similar, except that its first IF is at 47.225 MHz and that it uses a BJT as a mixer. So far, OK. Now, one wonders how it does U/U and V/V receive. Well, there is a duplicate RF chain in each receiver, for the opposite "sex" -- so in the VHF receiver, there is a UHF RF amp. HOWEVER, the UHF RF amp in the VHF receiver (got it straight?) uses a

FIXED image reject filter. This explains why it's response isn't as wide (receiving frequency range) as the true UHF receiver, and is relatively poor outside the ham bands. It also explains how come it's IM performance is BETTER than the true UHF side -- no varactors! The downside is that the LO for the UHF receive on the VHF side is set for the VHF IF, that is 15.25 MHz. Since the fixed image reject filter for this section is still quite wide (needs to pass the 420-450 range), the possibility for image response is quite high. (e.g. listen to 445 MHz on the VHF side, you really hear 475.5 MHz or 414.5 MHz, haven't figured out which -- still reading schizmos.)

Similarly, receiving VHF on the UHF side is as interesting. Again, the image reject filter is fixed, but that isn't a big of a problem since the IF here is 47.225 MHz, which is greater than half the 110-180 MHz range. Again, no varactors, and yes, you get a FET mixer. The LO comes from the UHF PLL, but is divided down, so it may be a bit noisier. Because of the higher IF, VHF receive on the UHF side may be superior in both IM and image rejection than listening to VHF on the VHF side. Anyone try it?

The rest of the radio seems OK, though it's obvious that the designers are looking at $$ when thinking.

Well, I wrote this, so no measurements today, maybe tomorrow.....

     -Ken

Date: Mon, 28 Mar 1994 10:07:27 GMT
From: agate!howland.reston.ans.net!math.ohio-state.edu!news.acns.nwu.edu!ftpbox!mothost!mdisea!mmddvan!vanbc.wimsey.com!holly!jerrys@ames.arpa
Subject: WHAT IS THE BEST DUAL BANDER HAND HELD 2M/70CM
To: info-hams@ucsd.edu

I am in the process of trying to decide what to buy, I know I am
asking for it, but I would greatly appreciate any comments on
Dual Band Hand Helds. I am looking for all sorts of comments.
GOOD BAD UGLY Etc. Please drop me a line. I have the money and
I am awaiting your response.
Thanks in Advance.
Jerry

SPEND, YAESU, ICOM, KENWOOD, ALINCO, STANDARD?

Date: 29 Mar 94 17:19:11 GMT

From: agate!howland.reston.ans.net!europa.eng.gtefsd.com!gatech!taco.cc.ncsu.edu!
riogrande.acs.ncsu.edu!nsyslaw@ucbvax.berkeley.edu
Subject: World Wide Web Sites wanted!
To: info-hams@ucsd.edu

Scott Ehrlich (wy1z@netcom.com) wrote:

: I am looking for all pointers to Hypertext sites (World Wide Web sites).
: I know there is a UK callsign server available via WWW.
: What else is there?
: Thanks much!
: PLEASE PLEASE e-mail direct if possible.

Done.

: Scott

Here's a couple: (for everybody's benefit)

*   North American Ham Radio WWW server:
 http://www.acs.ncsu.edu:80/HamRadio

*   United Kingdom Ham Radio WWW Server:
 http://www.mcc.ac.uk/OtherPages/AmateurRadio.html

The first server has links to Sarex Information,
North American and United Kingdom callbooks, Bill Pasternak's
Amateur Radio Newsline, and an online Repeater Database.

There is a quiz server being written (to take simulated
tests - generated on the fly), and a searchable index
for the repeater database is in the works too. There is
also a feedback page for you to voice your suggestions
and opinions.

Enjoy!

--

 Lou Williams (nsyslaw@acs.ncsu.edu) | aka: KE4ARM
 Unix Systems Programmer | Phone: (919) 515-2794
 NCSU Administrative Computing Services | FAX: (919) 515-3787

 URL: http://www.acs.ncsu.edu/~nsyslaw

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